

THE MAKING OF AN HERBARIUM

BULLETIN NO. IV
ROGER WILLIAM PARK MUSEUM

♦
CLUTE

3.7.08

BULLETIN No. IV.
Roger Williams Park Museum
PROVIDENCE, R. I.

THE MAKING OF AN HERBARIUM
BY
WILLARD N. CLUTE,
EDITOR OF THE FERN BULLETIN AND
THE AMERICAN BOTANIST. * * * * *

Price 10 cts.

— DEC. • 1904 —

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FIRST PAPER—COLLECTING.

† HERE are many ways of making an herbarium, but few ways of making a good one. A certain amount of experience is necessary to obtain the best results, and it may almost be set down as an axiom that a really valuable herbarium cannot be made until the maker has served an apprenticeship in the art. In my opinion, however, even the beginner's herbarium is susceptible of much improvement if proper directions are carefully followed, and in the hope of providing these directions the following pages are presented. Since nearly all young botanists collect only the flowering plants, I shall at present confine my remarks to this branch of the subject.

The real making of the herbarium begins in the field with the collection of the specimens. It seldom happens that the beginner has a proper appreciation of the value of roots and stems or, in fact, of any part of the plant except the flower and a few of the leaves on the stem near it. But if it be remembered that the herbarium is the best means we have been able to devise for preserving plants for study and comparison at times when they are not in condition in the field, the importance of securing in such specimens everything that will be of use in studying them, is apparent.

The whole plant, including the roots, should always be taken when practicable. In annual plants, a single specimen may show buds, flowers, fruit, leaves and roots, but in others it may require several collections of the same species before all parts are well represented. In addition to this, it is well to collect every variation from the normal, for these latter often throw interesting side-lights upon the evolution and relationships of the plants. In a word, the specimens of any species should represent as nearly as possible all phases of that species. By keeping this in mind, the collector should find himself in possession of material for an ideal herbarium at the end of the season. It will require some botanical knowledge, however, to collect to the greatest advantage. In some families of

plants certain characters are given special importance in the identification, and the plants must be collected when these are at their best. Thus in the cress, sedge and parsley families, mature fruit is of prime importance, and ferns without fruit are of little value. As a general thing, representative specimens of a plant are taken after it has been blooming some days, in which case it will usually show buds, flowers and young fruit.

In the matter of how plants should be collected, there is great diversity of opinion. It may be said that the methods employed depend somewhat on circumstances. No one method will fit all cases. The collecting box of tin is excellent for collecting plants for study in the fresh state, and for collecting the lower forms of plant life, but the average collector for the herbarium has little use for this except as an adjunct to the collecting press. It may be used to advantage in wet or windy weather, for use in which the collecting press is unfitted for obvious reasons. Probably the best press for general collecting is made of two stout pieces of the kind of pasteboard known as binder's board, twelve by seventeen inches in size, between which are placed fifty or more sheets of the cheapest kind of white paper, cut eleven by sixteen inches, the whole being held together by two straps, with buckles which pass around it (Fig. 1). Instead of binder's boards, the sides of

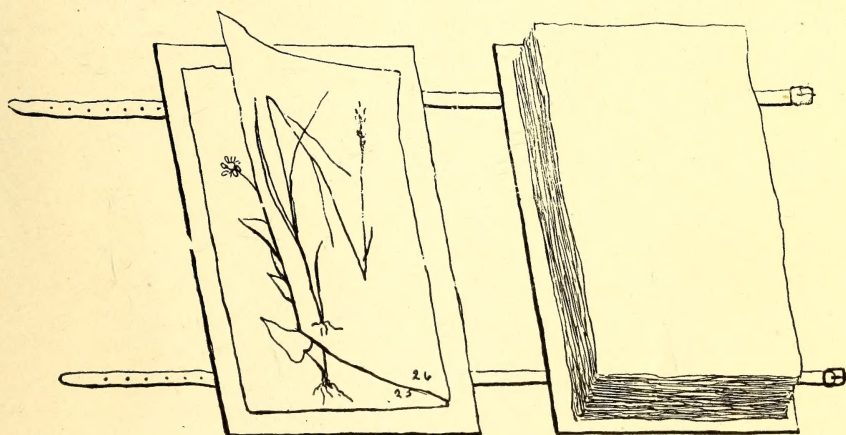


Fig. 1.

the press are often made of wood or wire lattice-work, but the boards are better if they can be procured. In addition to their standing more hard usage, the edges will bend about the plants collected, keeping the moisture in, a condition greatly to be desired until the drying press is reached, however much we may wish to be rid of it later. The collecting press may be of any size, but the size given above is the most convenient from the fact that the collecting sheets are slightly smaller than the standard herbarium sheet, thus insuring that all specimens collected will be of proper size for mounting. Specimens that are so large that they can only with difficulty be crowded on the herbarium sheet, are an abomination. If one happens upon plants which he wishes to preserve and has left his press behind, a few old newspapers make a fairly good substitute. The plants should be placed one upon another in a compact pile and then wrapped about with the papers. If kept in a cool, shady place, the plants will remain fresh for a long time. The crown of one's hat may also serve in an emergency. I have known of specimens that traveled more than thirty miles in such a receptacle, and came out in good order.

The use of the collecting press depends to some extent upon what and how much is to be collected. For desultory collecting about home, or for longer trips when a comparatively small number of specimens are to be collected, the press is operated thus: It is first opened and spread out flat. A sheet of the white paper is then laid on one side and a plant placed upon it, then another sheet of paper and another specimen and so on, paper and plants alternating until all that have been gathered are formed into a compact pile (Fig.2) The press

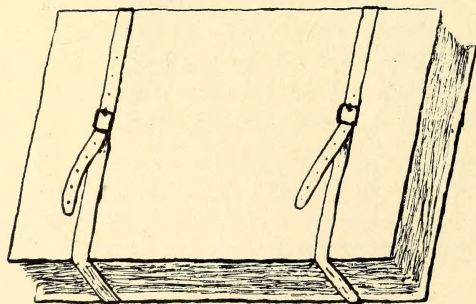


Fig. 2.

is then closed over the pile and drawn together as tightly as possible by means of the straps. It may now be placed somewhere in the shade, while other plants are being collected. Collectors who make several hundred specimens a day, collecting twenty or more specimens of each kind, frequently place all of one kind together without papers between, leaving the arrangement on sheets to be done when the plants are put into the drying press; but this should never be done except when plants are abundant and there is not time or facility for collecting them otherwise.

Plants, even when carefully collected and preserved, are absolutely worthless without data. The collector of a limited number of specimens should have time to write at least the date and locality upon the collecting sheet as each specimen is put into the press. In collecting many sheets of the same species a certain number may be given to each species, and should be placed on every sheet collected. Each species should be given a different number. It is the practice to begin with 1 and number consecutively. If a plant which has been collected is collected again later, it should be given a new number. This number, together with all the data of the plant, is then set down in a book kept for the purpose. The latter method saves much writing in the field, the numbers on the sheets enabling the collector to refer at once to the proper data for any plant when desired. Too much stress cannot be laid upon the value of abundant field notes. If every botanist would carry a note-book in which to enter everything of interest about the plants, the study of them later in the herbarium would be much more attractive than it is at present.

It frequently requires considerable ingenuity to properly arrange plants in the press. Those that are less than sixteen inches high are easily managed, and much taller specimens may be bent once, twice or thrice to make them of the right size. There are few herbaceous plants in the Northern States that cannot be disposed of in this manner. Of others it will suffice if flowers, fruit, all forms of leaves and a section of the stem are preserved. The herbarium will look much better if bulky roots, stems and fruits are pared down on one side, or in some cases on both, before the plant is pressed.

Each plant, as it is put into the press, should be arranged as it is to lie on the herbarium sheet. In the case of large plants, one specimen will suffice for a page, but of small ones it is well to press several on the same sheet, taking care that the plants do not overlap one another. It was formerly thought necessary to carefully spread out every leaf as the plants were put in press, but a certain amount of negligence here is rather to be commended, since if all the leaves are so carefully spread, it may be difficult to study the under surfaces of any of them when the specimen is mounted. On this point, therefore, the advice is, Be careful, but not too careful.

SECOND PAPER—DRYING.

AFTER a day in the field the collector may return much fatigued, but if he would have good specimens no time should be lost in getting his plants into the drying-press. To allow them to remain in the collecting-press for any length of time is to run the risk of making inferior specimens. The drying-press being designed to remove the moisture from the plants, it follows that the press which will do this with the least expenditure of time and labor on the part of the collector is to be preferred. The form most commonly used is essentially like the collecting-press, except that it contains sheets of thick bibulous paper instead of the thin collecting sheets. It may be remarked here, that since the object is to rapidly absorb the moisture, any bibulous paper, such as blotting paper or pads made of old newspapers, will do; but the kind favored by botanists is the material sold in the shops under the name of "deadening felt" or "felt paper," and used by house-builders for a variety of purposes. It is placed on the market in rolls, each of which contains a strip 150 feet long and three feet wide and costs about \$1.50. Any large paper or hardware store should have it. The driers should be 12 by 18 inches in size. The roll cuts to this size without waste, giving three hundred driers, which will usually be found sufficient for drying the plants collected about home.

When the driers are ready for the plants, the collecting-

press is opened, two driers are laid on some level surface, as a floor or table, and upon these the first plant is laid, being lifted from the press upon its collecting sheet, the plant itself not being handled. Over the plant is then placed a sheet of the collecting paper, and upon this two more driers and then another plant, building up the pile in this way as high as desired. If this work has been properly performed, each plant will now be lying upon a sheet of white paper, covered by a sheet of similar material and separated from the next plant by two driers. Upon this pile sufficient weight should be placed to insure that the plants will dry perfectly flat. If it is desired to re-arrange any of the plants upon their collecting sheets, or to straighten out leaves, petals, etc., it should be done while putting the plants in press. When the process of drying has once begun, the plants should not be disturbed.

In twelve hours after the plants have been put in press, the weights should be removed, a supply of fresh driers obtained, and the plants still in their white papers transferred to the fresh driers, building up the pile as before. The driers first used will be found to be quite moist and must be dried either by sunlight or artificial heat before they can be used again. In the process of drying a set of plants, the driers must be changed several times, but the same white papers are used throughout and the plants never removed from them. Some collectors do not use a sheet of the thin paper to cover each plant, but it is best to do so, as otherwise many plants will stick to the driers. The second change of driers may come twenty-four hours after the first, the process described above being repeated. Usually one or more changes follow at intervals, being governed by the condition of the plants. When the plants appear fairly dry, they may be left under heavy pressure for some days more, when they will be ready for mounting.

To many collectors the frequent changing of driers here advocated may seem a sheer waste of time, but after having examined a hundred thousand specimens made by a variety of collectors, good, bad and indifferent, I repeat with emphasis that the more frequently the driers are changed, especially during the first two days of drying, the better will be

the specimens resulting. I am aware that specimens can be made by merely placing plants between driers under sufficient weight and forgetting all about them until they are needed, but such specimens, while they may answer for the identification of a species, are good for nothing else. The leaves have turned brown or yellow and the delicate tints of the flower have faded. By the other method it is possible to retain the colors of even many parasitic plants which the botanist has declared are foreordained to blacken in drying.

I may be pardoned for giving a word to the drying of the driers, for there is a knack in doing even this. At best the spreading out and picking up of many driers is a back breaking labor, and anything that will lighten this is worth attention. With some collectors it is the practice to cut the driers twice as large as needed and fold them once, making what is equivalent to two driers joined together by one of the long sides. This can easily be hung over a line, or even set up on an end to dry. In the long run, however, it will doubtless be found easier to cut the driers of the usual size, and dry by spreading out in the sunshine. If one selects a level space which is already warmed by the sun's rays, he may spread down two driers at a time and both will dry in the course of three hours. If care is taken to put down the second pair of driers so that they just overlap the first, the third slightly overlapping the second and so on, like the shingles on a house, when the time comes to take them up, instead of picking each up separately, it is only necessary to begin at number one and with a sliding motion scoop the rest into a neat pile with one move—a great saving in both time and labor. If these driers are used while still warm from the sun, the process of drying is greatly facilitated.

The pressure to be put upon a pile of drying plants depends in a great measure upon the plants themselves. It may vary from fifteen to seventy-five pounds, forty pounds being a fair average. In fleshy plants too great a weight may crush the parts out of all resemblance to the original form, but, as a rule, plants seem to get too little pressure rather than too much. The means of applying pressure to the pile of drying plants are various. Thumb-screws, occasionally used, cannot be recommended, since they do not permit the

pressure to be gauged nor allow it to follow the plants as they shrink in drying. Two stout straps are often used to give pressure, as in the collecting-press, especially if the collector is moving from one place to another every few days, in which case the straps have the added advantage of keeping the plants together during transportation; but this method is open to the same objections as the thumb-screws. For pressing plants at home, a series of weights placed on top of the drying pile is best. These weights may consist of stones, stout sacks of sand, or any other thing that includes much weight in little space. There are certain plants, of which the common live-forever is a good example, that cannot be dried by ordinary means. Placed in a pile of driers well weighted down they continue to grow. Good specimens of such plants can be made by placing each plant under a drier and vigorously ironing it with a warm flat-iron until the plants are nearly dry, when they may be treated in the ordinary way. Flowers with thick heads, like the sunflowers, are sometimes pressed by being surrounded by cotton batting or wadding to prevent the ray flowers from shrivelling. In drying plants there will doubtless arise many occasions in which the foregoing rules for pressing must be modified. In all such cases it should be remembered that the best methods are those dictated by common sense.

THIRD PAPER—MOUNTING.

† **N**o part of herbarium-making have greater improvements been made than in the methods of mounting plants. It was once customary to place them between folded sheets of paper, but by such an arrangement the plants were easily damaged and the labels lost or misplaced, making it impracticable for any herbarium that is frequently consulted. Nowadays, in all herbariums worthy of the name, the plants are mounted on single sheets of paper, to which they are fastened by various means.

The mounting sheet should always be $11\frac{1}{2}$ by $16\frac{1}{2}$ inches in size. The beginner frequently cannot see the necessity for being so particular about this. For his benefit it may be

pointed out that since this size has been adopted by all representative herbariums, plants mounted on paper of other sizes lose much of their value either for sale or exchange, as they cannot readily be incorporated with other collections. When the owner tires of such an herbarium, no one else wants it, while if it consisted of sheets of the standard size, any botanical institution would be glad to preserve it. The mounting sheet may vary in weight from heavy writing paper (unruled) to thin card-board, according to individual taste. The material most used is called ledger paper, from its use in the manufacture of such books. The heaviest grade of this is the one suitable for ordinary plants. Each ream of 500 sheets $11\frac{1}{2}$ by $16\frac{1}{2}$ inches should weigh about twenty pounds or more and cost about twenty cents a pound. It is not advisable to use paper lighter than this, and for thick specimens, such as the conifers, hickories, etc., light card-board should be used. It is also well to look to the composition of the paper. A paper made of wood-pulp will soon turn brown upon exposure to the light, and is unfit for use. Care should also be taken to select a paper with a firm, hard surface. The price given above is for the best grades of linen rag stock.

Until very recently it was the practice to fasten the plants to the sheets by strips of gummed paper. A better way has now been devised, which consists in gluing them to the sheets. The advantages of the new process are many. It is quicker, neater, holds the plants more firmly, and is believed to preserve them from injury better than any other method. The only objection to it worth considering is that when the plants are thus mounted they are mounted to stay, and can never be taken from the sheets and their undersides examined. If we had to deal with specimens made in the old way, with every leaf and flower carefully pressed with the same side up, this objection would have some weight, but, as plants are now pressed there are always leaves enough showing the undersides, and flowers enough to show all parts, making it unnecessary to remove plants from the sheets.

The first attempts at gluing plants were made with glue such as cabinet-makers use. It was applied hot with a brush, and besides being a tedious method, frequently wrinkled or discolored the mounting paper. The kind now used is the

prepared liquid glue, which is quite satisfactory. It may be bought at any hardware store. In mounting plants by the new method, all that one needs besides the glue is a stock of driers, some collecting sheets and a sponge. After the label has been pasted upon the sheet to be used in mounting, the operation proceeds as follows: Having spread a little of the glue very thinly on a piece of paste-board or old newspaper, two driers are laid upon the table and on them the mounting sheet. The plant is laid down in the glue and at once taken up and transferred to the mounting sheet. It is then covered with a sheet of thin white paper, such as a collecting sheet, two more driers are put upon it and it is finished. The operation is repeated with other plants, which are piled up one above another with driers between as in pressing plants. When about six plants have been treated thus, the pile is put under about twenty pounds pressure while another half-dozen are being mounted. After this the thin sheets covering the first mounted specimens are turned over, to prevent any glue which may have got on the upper surface of the plant from sticking them together. The pile may then be set away under pressure for a day or two for the glue to dry.

A few minutes' practice will enable any one to satisfactorily mount plants in this manner. Two hundred plants in seven hours is a fair average. If the glue is too thick, it may be thinned with a little vinegar. It is not intended that every part of the under surface shall be covered with glue. On the contrary, if a plant is laid loosely on the sheet, it will be seen that it touches it at comparatively few points. If these are covered with glue, it will be sufficient. Heavy stems should, of course, have the greatest amount of glue. If the plant takes up too much glue when dipped into it, the excess may be taken off by laying the plant with glued side down on a piece of newspaper. Repeat this until enough has been removed. The sponge is kept wet, near at hand, for taking glue from the operator's fingers and from the upper surface of the plants.

The plants should be mounted with their heavy stems as nearly as possible parallel with the long diameter of the mounting sheet. Two different species should never be mounted on the same sheet, nor two plants collected at different times, although several plants collected at one time may

be so mounted. In the case of small plants, it is well to mount several specimens on a sheet. When two large plants are mounted together it is advisable to mount one with the root turned toward the top of the page, which makes the bundles of mounted plants of equal thickness throughout. Avoid crowding specimens into the center of the sheet. Heavy parts should be placed near the margins, but no part should be nearer than half an inch. Care should be taken when mounting to have the best side of each plant up. Ferns should, of course, be mounted with the sporangia showing, and bell-shaped flowers with the inside of some of the corollas visible.

The practice of poisoning plants seems to be going out of favor, and tight cases with close-fitting doors depended upon to keep the plants from their insect foes. It is noteworthy that certain families of plants, as the ferns, seem to have no charms for insects, while others, as the composites, are apparently considered choice tid-bits. If the plants are to be poisoned, this must be done before they are mounted. The operation is a tedious one under any circumstances. A pretty strong solution of corrosive sublimate is used, and the plants are either dipped into it or it is sprayed upon them. They are then laid between driers until the moisture has evaporated. The process is said to frequently discolor the plants and the poison is most dangerous to handle, from which it seems probable that this method will gradually be abandoned. With close cases it is possible to fumigate the plants occasionally after they are mounted, with carbon bi-sulphide, which effectually prevents insect depredations.

It may be remarked in passing that too many collectors are engaged in making extensive herbariums in which each species is represented by a single sheet. It is far better to have fewer *species* and more *specimens*. Until one has brought together many representatives of one species from different parts of the country, he cannot know how much to allow for variation in his own plant. Indeed, two localities near to each other will often show forms that are quite different in appearance. To the private individual, studying the plants about him, the herbarium stocked with material that will throw light upon the problems he encounters is the best for his purpose. A wise collector will shape his collections to this end.

FOURTH PAPER—LABELLING.

THE process of gluing the plants to the sheets finishes the work of mounting, unless the plants have particularly heavy parts, in which event these are sufficiently strengthened by being fastened to the sheet with strips of gummed linen. This linen comes in sheets containing about four square feet and costs twelve cents a sheet. For use it is first cut into strips $\frac{1}{2}$ inch, $\frac{3}{4}$ inch, 1 inch and $1\frac{1}{4}$ inches wide. These strips are then cut at right angles to the first, cut into strips from $\frac{1}{8}$ to $\frac{3}{8}$ inch wide, which will give strips of four different lengths and a choice of widths from broad to narrow. These strips, although much narrower than the worker with gummed paper is accustomed to use, will be found to be much stronger. For this reason a smaller number can be used, and their size renders them quite inconspicuous. In the case of large stems, a single strip at either end will suffice to hold them firmly. It will not be necessary to strap leaves, flowers or delicate parts; the glue alone will hold them. In the majority of specimens, a single strap at the base of the stem is enough. Every bend in the stem should have a strap. When the straps are placed at the ends of stems, they should never be more than $\frac{1}{4}$ inch from the end. The clean, neat appearance of plants mounted in this way and the absence of the broad bands of disfiguring paper recommend the method to all who see the work.

Next in importance to good specimens—perhaps I should say of equal importance—is the right kind of a label. I have seen thousands of specimens thrown into the fire for want of proper data. The plants were apparently named correctly, but none of the labels showed where they were collected, and they were therefore worthless. The young collector should thoroughly understand that it makes no difference *who* collected the plant nor what its name is, if the other data are present. It is perhaps because so many of us think we have finished with a plant when we have learned its name,

that the beginner invariably attaches so much importance to the Latin or Greek words applied to it. In reality, if we lose the name, it is easily found again from the plant itself, even if the scientist has mixed up the names in the meantime; but once the locality is lost, all is lost. But why attach so much importance to locality? Because a plant as a mere representative of the species is not worth much. Let it be known, however, in what latitude it was found, in what soil it grew and whether in sun or shade, and we can see by comparison with plants from other localities just how much all these things have affected it. Botany is not the study of scientific names, although many seem to think so; it is the study of the plants themselves. We are decidedly handicapped in such study if we do not know the conditions under which our specimens grew.

After the locality the fact of most importance is the date. Specimens are not valueless without it, but it should be added if possible. It is customary, also, to add the collector's name; in fact this is very desirable when the other data have been secured. Labels are seldom too circumstantial. They are usually lacking in such details as soil, altitude and surroundings, facts which should never be omitted if it can be avoided.

The style of label plays an important part in the appearance of the mounted specimen. The practice of embellishing labels with fancy borders and choice selections of display type has happily gone out. The present style is in the line of plain, neat slips, which tell what they are meant to tell in the short-

HERBARIUM OF C. A. DAVIS

Loc.....

Col.....

PLANTS OF NEW YORK AND VICINITY.

Collected by Willard N. Clute.

Hab.

.....190

No. 2.

est, clearest way. Some blank labels, taken from forms in actual use, will best illustrate this. No. 1 is what might be called a general utility label. It may be used for all plants received without the sender's own label, for plants collected by one's self, for sending out with duplicates, etc. It is the one label which all should own. The label here shown and the style of type used is exactly like the original. No. 2 is a special label for certain purposes. Any one who collects extensively in one place will find a similar label very useful. In this sufficient room is given under habitat for data regarding soil, etc. When one visits a certain region for collecting sets of its plants, a label similar to No. 3 may be used, or No.

Herbarium of the Yonkers Academy.

No.

CATSKILL MTS., NEW YORK.

Collected by P. A. Brown. Aug. 1, 1898.

No. 3.

Herbarium of the Pittsburg Institute Japanese Ferns PURCHASED 1899.	
LOC.....	
COL. H. E. CLARK	

No. 4.

2 may be modified for the purpose. In the latter case the number given to each plant should also appear on the label as in No. 3. If the collecting falls within a period of a few weeks, the date may also be printed. Nos. 2 and 3 are the size of the originals and printed from the only styles of type that can be recommended for this work. No. 4 is another special label whose purpose appears from its face.

Many collectors prefer labels like Nos. 1 and 2 with only the headlines printed. This is a matter of individual preference, but the tendency seems to be toward the styles here given. Labels should be printed on white or cream-colored paper that is sufficiently sized to take the ink for the rest of the label without blurring. It is well to avoid thick paper, as it is more difficult to paste smoothly to the sheets. Labels should always be fastened to the lower right-hand corner of the sheet, and for this purpose paste is better than mucilage. Some collectors give their labels a sort of individuality by printing some character on it before the regular label is printed. Thus the label with the plants collected in Yucatan by Dr. Millspaugh bears a green Y across which the usual label is printed. If this under-tint is not too strong, such labels are of value in enabling one to distinguish at a glance, when consulting an herbarium, whether the specimen is one for which he is searching or not.

FIFTH PAPER—ARRANGEMENT.

AFTER our plants have been properly mounted there comes the work of arranging them in the herbarium in such manner that they may be easily and quickly examined. If plants were assembled without order or system, the larger the herbarium became the greater would be the difficulty of finding a required specimen; but by a proper arrangement it is possible to turn to any given specimen almost as quickly as one would turn to a word in the dictionary. This being the case, it might be supposed that all our large herbariums are arranged upon some uniform plan of this kind, but unfortunately most of them are not. The botanist usually needs a guide book when visiting a strange herbarium.

In this day of identifying plants by comparisons with authentic specimens, a merely alphabetical arrangement of families, genera and species will not do, for the reason that this would almost certainly separate closely related forms. In his studies, the botanist is saved an infinite amount of time and labor if allied species are placed together. But if they are so placed, one who is not acquainted with the systematic arrangement of the species, may have much trouble in finding the half dozen members of the genus with which he is familiar. Confusion, therefore, is sure to exist when either the systematic or alphabetical arrangement alone is followed. A combination of the two is much the best.

In order that all may understand the working of such a scheme, let me sketch its application in the case of a large herbarium. Smaller herbariums can modify the plan to suit their needs. In the ideal herbarium, then, each species is placed as close to the next related species as it is possible to do in a linear arrangement. The sequence now generally followed is that of Engler and Prantl's "*Pflanzenfamilien*" although there are still many herbariums arranged after systems long out of date. Leaving out of the question lower forms

of life, let us assume that our herbarium begins at the ferns and extends through all the families of flowering plants to the highest, the composites. In order to know where to find each family in this vast host, an index is necessary. For this purpose the families are numbered in sequence, beginning with the ferns. An alphabetical list is then made, in which the name of each family is followed by its number in the sequence. A glance at this list will at once tell us where to look for the required family. Having found this, we must have another index, for just as the families follow a sequence of relationship, so do genera and species. By arranging and numbering the genera in sequence and making a list similar to the first, the difficulties in finding the genera are overcome. The species must still be disposed of. In small genera we may be able to get along without indexes, but with the large genera which often contain more than a hundred species it is better to arrange the species in their natural sequence, in this following the latest monographs of the genera, and providing an alphabetical index also.

For locating the families and genera in the cases, several devices are employed. In some herbariums a piece of pasteboard the size of the mounting sheet with a smaller piece of the same width hinged to one of its ends is used. The large piece is laid in the pigeon hole at the beginning of a family and the smaller piece, hanging down in front, has the family and list of genera which it contains, printed upon it. This, however, is a downright nuisance, for the hanging cardboard is always in the way. Another way is to label the pigeon holes by printed slips which are held in place by a contrivance fastened to the partitions, but this is objectionable because there is then no place for an index and because the labels have to be changed every time there is an addition of new material. Perhaps the best way yet devised, is to make use of a piece of light wood the size of the mounting sheet and about three-eighths of an inch thick. This is laid in the pigeon hole at the beginning of each family. On the visible end is printed the name of the family and its number. The upper surface of such a marker gives ample room for a catalogue of all the

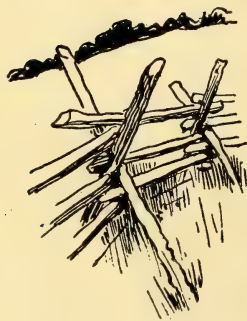
genera in the family, if not, the other side may be used also. This, too, may be recommended for use as a marker for the larger genera, in which case the list of species may be printed upon it. Such a list is always in position for consulting.

In all large herbariums there is supposed to be a species cover for each species. This is made of a medium grade of manila paper cut to a size of 16 $\frac{5}{8}$ by 26 inches and folded once. In this the sheets of mounted specimens fit like leaves in a book. At the beginning of each genus a slightly heavier cover of the same size and material, called a genus cover, should be placed. This is to contain species that are not yet placed in species sheets, whether for lack of time, or because they have not been satisfactorily identified. In the lower left-hand corner the name of the genus should be written and the same place on the species cover should contain the name of the species.

It is customary to place several genus covers at the end of the genus, in which to place foreign material. When the collections are large it is difficult to distinguish between these plain covers, therefore various color-schemes for making the task easier have been suggested. The Field Columbian Museum uses colored manila covers for its foreign specimens, but the trouble of obtaining and keeping in stock a supply of the colors needed may prevent many from adopting this scheme. A less expensive method, which gives equally good results, is to have a number of slips 3 by 4 inches in size cut from thin paper of the desired color. These may be pasted to the lower left-hand corner of the ordinary genus cover, and has the advantage over entire-colored covers, in that the color can be changed at will by pasting a second slip over the first.

If colors are used to mark the different countries, they should be used in the order following: For North America, plain manila; South America, red; Europe, blue; Asia, orange; Africa, green; Australia and Polynesia, yellow.

In conclusion it may be said that an herbarium made after the directions herein given will continue to increase in value with age, and instead of being thrown away as so much rubbish when the owner is done with it, will find many others glad to preserve it.



LIST OF MUSEUM BULLETINS

ISSUED

- | | | | |
|---|--|---------|------|
| 1 | Check-List of Coleoptera of R. I. | Davis | 25c. |
| 2 | Check-List of North American Unionidae | Davis | 10c |
| 3 | Use of Kerosene Emulsion | Sherman | 5c. |

PREPARED

- | | | | |
|---|--------------------------------------|----------|------|
| 4 | The Making of an Herbarium | Clute | 10c. |
| 5 | Check-List of R.I. Rotifera | Howard | 5c. |
| 6 | Collecting & Mounting Micro-Lepidop. | Kearfott | 25c |
| 7 | Catocalae of Lonsdale, R.I. | Dearden | 5c. |
| 8 | Mollusca of the Bermuda Islands | Davis | 25c |

IN PREPARATION

- 9 Birds of R.I.
- 10 Plants of R.I.
- 11 Minerals of R.I.
- 12 Fossils of R.I.
- 13 Mammals & Reptiles of R.I.
- 14 Shells of R.I.
- 15 Fishes of R.I.
- 16 Crustacea of R.I.
- 17 Lepidoptera of R.I.
- 18 Hymenoptera of R.I.
- 19 Orthoptera & Neuroptera of R.I.
- 20 Hemiptera of R.I.
- 21 Diptera of R.I.
- 22 Arachnida of R.I.

N.B. This order of numbers is not final.
Bulletins exchanged for desiderata.
Other Check-Lists on sale at the Museum.

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